NAT'L INST. OF STAND & TECH R.I.C.
A11104 529917
REFERENCE
NIST
PUBLICATIONS

NVLAP®

National
Voluntary
Laboratory
Accreditation
Program

POSIX

Portable Operating System Interface

Jeffrey Horlick
Martha M. Gray

NIST HANDBOOK 150-7

U.S. Department of Commerce
Technology Administration
National Institute of Standards
and Technology

QC
1
.U51
NO.150-7
1995

The National Institute of Standards and Technology was established in 1988 by Congress to "assist industry in the development of technology . . . needed to improve product quality, to modernize manufacturing processes, to ensure product reliability . . . and to facilitate rapid commercialization . . . of products based on new scientific discoveries."

NIST, originally founded as the National Bureau of Standards in 1901, works to strengthen U.S. industry's competitiveness; advance science and engineering; and improve public health, safety, and the environment. One of the agency's basic functions is to develop, maintain, and retain custody of the national standards of measurement, and provide the means and methods for comparing standards used in science, engineering, manufacturing, commerce, industry, and education with the standards adopted or recognized by the Federal Government.

As an agency of the U.S. Commerce Department's Technology Administration, NIST conducts basic and applied research in the physical sciences and engineering, and develops measurement techniques, test methods, standards, and related services. The Institute does generic and precompetitive work on new and advanced technologies. NIST's research facilities are located at Gaithersburg, MD 20899, and at Boulder, CO 80303. Major technical operating units and their principal activities are listed below. For more information contact the Public Inquiries Desk, 301-975-3058.

Office of the Director
- Advanced Technology Program
- Quality Programs
- International and Academic Affairs

Technology Services
- Manufacturing Extension Partnership
- Standards Services
- Technology Commercialization
- Measurement Services
- Technology Evaluation and Assessment
- Information Services

Materials Science and Engineering Laboratory
- Intelligent Processing of Materials
- Ceramics
- Materials Reliability[1]
- Polymers
- Metallurgy
- Reactor Radiation

Chemical Science and Technology Laboratory
- Biotechnology
- Chemical Kinetics and Thermodynamics
- Analytical Chemical Research
- Process Measurements[2]
- Surface and Microanalysis Science
- Thermophysics[2]

Physics Laboratory
- Electron and Optical Physics
- Atomic Physics
- Molecular Physics
- Radiometric Physics
- Quantum Metrology
- Ionizing Radiation
- Time and Frequency[1]
- Quantum Physics[1]

Manufacturing Engineering Laboratory
- Precision Engineering
- Automated Production Technology
- Intelligent Systems
- Manufacturing Systems Integration
- Fabrication Technology

Electronics and Electrical Engineering Laboratory
- Microelectronics
- Law Enforcement Standards
- Electricity
- Semiconductor Electronics
- Electromagnetic Fields[1]
- Electromagnetic Technology[1]
- Optoelectronics[1]

Building and Fire Research Laboratory
- Structures
- Building Materials
- Building Environment
- Fire Safety
- Fire Science

Computer Systems Laboratory
- Office of Enterprise Integration
- Information Systems Engineering
- Systems and Software Technology
- Computer Security
- Systems and Network Architecture
- Advanced Systems

Computing and Applied Mathematics Laboratory
- Applied and Computational Mathematics[2]
- Statistical Engineering[2]
- Scientific Computing Environments[2]
- Computer Services
- Computer Systems and Communications[2]
- Information Systems

[1] At Boulder, CO 80303.
[2] Some elements at Boulder, CO 80303.

NIST HANDBOOK 150-7

National Voluntary Laboratory Accreditation Program

POSIX

Portable Operating System Interface

Jeffrey Horlick
Martha M. Gray

January 1995

U.S. Department of Commerce
Ronald H. Brown, Secretary

Technology Administration
Mary L. Good, Under Secretary for Technology

National Institute of Standards and Technology
Arati Prabhakar, Director

National Institute of Standards and Technology
NIST Handbook 150–7
68 pages (January 1995)
CODEN: NIHAE2

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON: 1995

For sale by the Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402-9325

NVLAP AND THE NVLAP LOGO

The term NVLAP and the NVLAP logo are Federally registered trademarks of the National Institute of Standards and Technology and the Federal Government, who retain exclusive rights therein. Permission to use the term and/or the logo is granted to NVLAP-accredited laboratories for the limited purposes of announcing their accredited status, and for use on reports that describe only testing and calibration within the scope of accreditation. NIST reserves the right to control the quality of the use of the term NVLAP and of the logo itself.

PREFACE

NIST Handbook 150-7 presents the technical requirements of the National Voluntary Laboratory Accreditation Program (NVLAP) for FIPS 151-2 "Portable Operating System Interface (POSIX) - System Application Program Interface [C Language]" conformance testing (POSIX LAP). It is intended for information and use by the staff of accredited laboratories and laboratories seeking accreditation, other laboratory accreditation systems, users of laboratory services, and organizations needing information on accreditation requirements.

This handbook supplements NIST Handbook 150, *NVLAP Procedures and General Requirements*, which contains Part 285 of Title 15 of the U.S. Code of Federal Regulations (CFR) plus all general NVLAP procedures, criteria, and policies. The criteria in NIST Handbook 150 encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987). NIST Handbook 150-7 contains information that is specific to the NIST POSIX program and interprets the Procedures and General Requirements where appropriate.

The numbering of the sections of this handbook is patterned after NIST Handbook 150; for example, Section 285.3 of NIST Handbook 150 presents the description and goal of NVLAP, whereas Section 285.3 of this handbook presents a description of the POSIX LAP. Where there is no information specific to POSIX testing, the section number is omitted.

Questions or comments concerning this handbook should be submitted to the National Institute of Standards and Technology/NVLAP, Building 411, Room A162, Gaithersburg, MD 20899; phone (301) 975-4016; FAX (301) 926-2884; e-mail horlick@enh.nist.gov.

ACKNOWLEDGMENTS

The technical requirements and checklist for the NVLAP POSIX Laboratory Accreditation Program were developed by Anthony Cincotta, Martha Gray, and the late James Hall of the National Institute of Standards and Technology, Computer Systems Laboratory.

NVLAP program handbooks, published since 1982, comprise the combined efforts of the entire NVLAP staff, both past and present.

TABLE OF CONTENTS

PREFACE iii

ACKNOWLEDGMENTS iv

SUMMARY vi

Sec. 285.1 Purpose 1

Sec. 285.2 Organization of procedures 1

Sec. 285.3 Description of POSIX LAP 1

Sec. 285.4 References 1

Sec. 285.5 Definitions 2

Sec. 285.6 NVLAP documentation 2

Sec. 285.22 Assessing and evaluating a laboratory 3

Sec. 285.33 Criteria for accreditation 5
- (a) Scope 5
- (b) Organization and management 5
- (c) Quality system, audit and review 5
- (d) Personnel 6
- (e) Accommodation and environment 6
- (f) Equipment and reference materials 6
- (g) Measurement traceability and calibration 7
- (h) Calibration and test methods 7
- (j) Records 7
- (k) Certificates and reports 8

APPENDICES
- SAMPLE ACCREDITATION DOCUMENTS A-1
- GENERAL OPERATIONS CHECKLIST B-1
- SPECIFIC OPERATIONS CHECKLIST C-1
- NIST COMPUTER SYSTEMS LABORATORY D-1

SUMMARY

The National Institute of Standards and Technology (NIST), Computer Systems Laboratory (CSL) administers the NIST POSIX Testing Program that issues a Certificate of Validation for products that meet program criteria when tested in laboratories accredited by NVLAP. The validation criteria and the test methodology were developed by NIST CSL. Additional information about the NIST POSIX Testing Program is available from NIST CSL (see Appendix D).

Any laboratory (including commercial, manufacturers', university, federal, state, or local government) that uses test methods listed in this document may apply for NVLAP accreditation. Accreditation will be granted to a laboratory that complies with the conditions for accreditation as defined in this document. Accreditation does not mean a guarantee of laboratory performance or of product test data—it is a finding of laboratory competence.

Testing services covered: Conformance testing of Federal Information Processing Standards (FIPS) 151-2 Portable Operating System Interface (POSIX) - System Application Program Interface [C Language].

Period of accreditation: One year, renewable annually.

On-site assessment: Visit by a technical expert to determine compliance with the NVLAP criteria before initial accreditation and every two years thereafter. Monitoring visits as required. Initial assessment requires a demonstration of testing and procedure. Test demonstration can be at the laboratory site, a client site, a different laboratory designated site, or at a site designated by NIST.

Assessors: Selected from technical experts with experience in the appropriate field(s) of testing.

Proficiency testing: Each laboratory is required to demonstrate its capability to successfully perform conformance testing using the National Institute of Standards and Technology - POSIX Conformance Test Suite (NIST-PCTS). Proficiency testing is required for initial accreditation and may be conducted annually thereafter. Advance notice and instructions are given before testing is scheduled.

Granting accreditation: Based on compliance with criteria, satisfactory on-site assessment and resolution of deficiencies, and proficiency testing

Fees: Payments are required as listed on the NVLAP fee schedule, including the administrative/technical support fee, on-site assessment fee, and test method fee.

Sec. 285.1 Purpose

The purpose of this handbook is to set out procedures and technical requirements for NVLAP accreditation of laboratories that test products for conformance to criteria set by the NIST POSIX Testing Program. It complements and supplements the NVLAP program procedures and general requirements found in NIST Handbook 150.

The interpretive comments and additional requirements contained in this handbook make the general NVLAP criteria specifically applicable to the POSIX LAP. This handbook also identifies the requirements for proficiency testing using the NIST POSIX Conformance Test Suite (NIST PCTS), the specific on-site assessment criteria, and the requirements for a quality system. The quality system requirements are designed to comply with the requirements of ISO Guide 25 and ISO 9002.

Sec. 285.2 Organization of procedures

(a) The numbering of the sections of this handbook is patterned after NIST Handbook 150, *NVLAP Procedures and General Requirements*, to allow easy cross-reference.

(b) The procedures and general requirements of NIST Handbook 150 and the interpretations and specific requirements in this handbook must be combined to produce the criteria for accreditation in the POSIX LAP.

(c) This handbook contains appendices which supplement the text:

(1) Appendix A provides examples of a NVLAP Certificate of Accreditation and a Scope of Accreditation for the POSIX LAP;

(2) Appendix B provides the General Operations Checklist, which NVLAP assessors use during an on-site technical assessment to evaluate a laboratory's ability to conduct testing in general;

(3) Appendix C provides the POSIX Specific Operations Checklist, which is used by NVLAP assessors during on-site assessments of laboratories. This checklist may also be used by the laboratories to structure the conduct of internal technical audits.

(4) Appendix D describes the NIST Computer Systems Laboratory (CSL) role in the establishment of Federal Information Processing Standards (FIPS) and product conformance testing programs.

Sec. 285.3 Description of POSIX LAP

The purpose of the POSIX LAP is to accredit laboratories that perform NIST POSIX conformance testing to assure that such laboratories are capable and competent to meet the needs of the NIST POSIX Testing Program.

The NVLAP POSIX LAP was initiated at the request of the NIST CSL to accredit laboratories that conformance test POSIX products for purchase by the U.S. Government. The test tool software, the NIST-PCTS was developed by NIST CSL.

The role of NIST CSL in the establishment of FIPS and product conformance testing programs is described in Appendix D.

Sec. 285.4 References

Reference documents, standards and publications for the POSIX program and their sources are given below.

(a) NVLAP publications

(1) NIST Handbook 150, *NVLAP Procedures and General Requirements*; and

(2) NIST Special Publication 810, 1994 edition, *NVLAP 1994 Directory*.

NVLAP publications may be ordered from:

NIST/NVLAP
Building 411, Room A162
Gaithersburg, MD 20899

Phone: (301) 975-4016
FAX: (301) 926-2884.

(b) NIST CSL documents

(1) *NIST POSIX Testing Policy - General Information*;

(2) *NIST POSIX Testing Policy - Certificate of Validation Requirements for FIPS 151-2*;

(3) *NIST-PCTS:151-2* Distribution, which includes software and instructions; and

(4) *NIST-PCTS:151-2 Installation and Testing Guide*.

NIST CSL documents may be ordered from:

NIST CSL
NIST POSIX Testing Program
Martha M. Gray
Building 225, Room B266
Gaithersburg, MD 20899

Phone: (301) 975-3276
FAX: (301) 926-3696.

(c) National Technical Information Service (NTIS) publications

(1) Federal Information Processing Standards Publication 151-2 (FIPS PUB 151-2), Portable Operating System Interface (POSIX) - System Application Program Interface [C Language], May 12, 1993; and

(2) Federal Information Processing Standards Publication 160 (FIPS PUB 160), C, March 13, 1991 with change #1, August 24, 1992.

NTIS publications may be ordered from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

Phone: (703) 487-4650
FAX: (703) 321-8547.

(d) Institute of Electrical and Electronics Engineers (IEEE) standards and related documents

(1) ISO/IEC 9945-1, Information Technology - Portable Operating System Interface (POSIX) - Part 1: System Application Program Interface (API) [C Language]; and

(2) IEEE Std 2003.1-1992, Information Technology - Test Methods for Measuring Conformance to POSIX.1.

These documents may be ordered from:

Institute of Electrical and Electronics Engineers
445 Hoes Lane, P.O. Box 1331
Piscataway, NJ 08855-1331

Order Phone: (800) 678-4333
FAX: (908) 981-9667.

Sec. 285.5 Definitions

Certification: A process to attest that a product is in conformance with a specific standard as determined through use of a specified test method.

Conformance: The state of an implementation satisfying the requirements and specifications of a specific standard as tested by a test suite.

Conformance testing: The testing of an implementation against the requirements specified in one or more standards.

FIPS: Federal Information Processing Standard (see also Appendix D).

NIST POSIX: Colloquial name for FIPS PUB 151-2, Portable Operating System Interface (POSIX) - System Application Program Interface [C Language].

PCTS: POSIX Conformance Test Suite, the Means of Test or test tool for POSIX Conformance testing.

System under test: The computer system hardware and software on which the implementation under test operates. (IEEE P2003/D3.0, March 1, 1994)

Sec. 285.6 NVLAP documentation

(a) Handbooks

(1) The NVLAP procedures and general requirements are contained in NIST Handbook 150. NIST Handbook 150 is used for all NVLAP testing laboratory and calibration laboratory programs. The portions of NIST Handbook 150 marked with a triangle in the margin do not apply to POSIX laboratories; they concern calibration laboratories.

The general terms used in NIST Handbook 150 are interpreted, expanded, and detailed in the program-specific handbook.

(2) The technical procedures and program-specific requirements are contained in this handbook.

(b) NVLAP Checklists

(1) Checklists contain definitive statements or questions about all aspects of the NVLAP criteria for accreditation. Checklists are filled out during the on-site assessment, discussed during the exit briefing, signed by the laboratory representative and the assessor, and a copy is given to the laboratory. The checklists become part of the laboratory history kept by NVLAP.

(2) NVLAP programs incorporate two types of checklists:

(i) The NVLAP General Operations Checklist addresses factors applicable to evaluating a laboratory's ability to conduct testing in accordance with the procedures and general requirements for accreditation. The factors include, but are not limited to, the laboratory's organization, management, and quality system in addition to its testing competency.

The General Operations Checklist, presented in Appendix B, is numbered to correspond to the requirements in NIST Handbook 150.

(ii) The Specific Operations Checklist, presented in Appendix C, is specific to NIST POSIX conformance testing, focuses on the testing requirements, and includes the assessor's observations of test demonstrations. This checklist may be revised when appropriate to reflect changes in the technical requirements, scope, and/or technology of the program.

(3) Each of the two checklists ends with a Comments and Deficiencies form. The assessor uses these forms to explicitly identify and describe deficiencies noted in the body of the checklists. Additionally, the assessor may use the form to document comments on any aspect of the laboratory or its performance.

Sec. 285.22 Assessing and evaluating a laboratory

(a) On-Site Assessment

(1) The on-site assessment for POSIX laboratories will most likely be performed by one or two NVLAP assessors in one day plus the following morning. All observations made by the assessors during the assessment are held in strictest confidence.

The on-site assessment may involve the laboratory site and a separate test site for the proficiency testing. If the site for the proficiency demonstration is geographically remote from the laboratory site, the demonstration will have to occur before the laboratory visitation.

The assessor will use the General Operations Checklist and the POSIX Specific Operations Checklist. The checklists serve to ensure a complete assessment and that all assessors cover the same items at each laboratory. The checklists contain questions to cover all possible assessment issues, both general and specific; however, not all questions will apply in all circumstances. On the other hand, the assessor may go beyond the checklists in order to delve more deeply into a technical issue.

The assessor will need to take breaks during the visit to fill in the NVLAP checklists and to prepare the On-Site Assessment Report.

The laboratory will be responsible for demonstrating its general knowledge of the NIST PCTS and competence to load and configure the PCTS, conduct a test, analyze test results, and prepare a test report.

(2) The agenda for a typical on-site visit is given below.

(i) The assessor(s) meets with laboratory management, supervisory personnel, and selected staff to explain the purpose of the on-site assessment and to discuss the schedule for the assessment activities. Information provided by the laboratory on its NVLAP application form may be discussed during this meeting.

The laboratory manager decides which staff members attend the meeting.

The assessor will ask the laboratory manager to assist in arranging times for interviews with laboratory staff members. While it is not necessary for the assessor to talk to all of the staff members, he/she

may select staff members representing all aspects of the laboratory.

Laboratory personnel should not answer questions they feel unqualified to answer. Knowing whom to ask or where to find the answer is usually considered an acceptable response by the assessor.

(ii) The assessor reviews laboratory documentation, including the quality system documents, quality manual, equipment records, software versions, testing procedures, test reports, personnel competency records, and personnel training plans and records.

The assessor will have reviewed the quality manual submitted to NVLAP before the on-site assessment. The assessor will discuss the manual with the designated laboratory staff and return the manual to the laboratory.

Although there must be a laboratory staff member available to answer questions, the assessor may wish to review the documents alone. The assessor does not usually ask to remove any documents from the laboratory.

The assessor will check personnel information for job descriptions, résumés, and technical performance reviews. The assessor need not be given information which violates individual privacy such as salary, medical information, or performance reviews outside the scope of the laboratory's accreditation. At the discretion of the laboratory, a member of its human resources department may be present during the review of personnel information.

(iii) The assessor examines hardware and software facilities for appropriateness, capability, adherence to specification, etc. at the laboratory site and, if appropriate, at the test site.

Laboratory staff members should be available to demonstrate hardware and software and to answer questions.

(iv) The assessor will conduct proficiency testing using the NIST-PCTS. This will be at the laboratory or another mutually agreeable site. The software and system under test during proficiency testing need not be NIST POSIX conformant.

(v) At the end of the on-site assessment, an exit briefing is held with the laboratory manager and staff to discuss the assessor's findings.

Comments not identified as deficiencies by the assessors should be given serious consideration, but are taken at the laboratory's discretion. Any disagreements between the laboratory and the assessor should be referred to NVLAP for further evaluation.

At the conclusion of the exit briefing, the laboratory Authorized Representative and the assessor both sign the On-Site Assessment Report and the checklists. A copy of the report and of the two checklists is given to the Authorized Representative.

(b) Proficiency Testing

(1) Proficiency testing is an integral part of the NVLAP accreditation process. Applicant laboratories will be required to participate satisfactorily in proficiency testing prior to initial accreditation. Laboratories renewing accreditation must have satisfactorily participated in all required proficiency testing during their previous accreditation period.

(2) To evaluate the effective and proper operation of a laboratory, proficiency testing may consist of several parts. The proficiency testing concept is designed to allow the evaluation of the laboratory's ability to produce repeatable and reproducible test data. Portions of the testing process may be "highlighted" in proficiency testing; e.g., software, hardware, data analysis, etc. Proficiency testing may embody the following:

(i) demonstration of the ability to load the NIST-PCTS for a NIST POSIX compatible system;

(ii) demonstration of the ability to configure a POSIX compatible system;

(iii) demonstration of the ability to install and execute the NIST-PCTS;

(iv) demonstration of the ability to interpret test results from the PCTS;

(v) demonstration of proficiency with the test suite during an on-site visit; and

(vi) submission of test reports to the NIST POSIX Certification Program.

(3) The results of proficiency testing will be made available to on-site assessors for use during laboratory assessment visits. Problems indicated by proficiency testing will be discussed with appropriate laboratory personnel, who will then be responsible for developing and implementing plans for resolving the problems.

Deficiencies identified by proficiency testing during an on-site assessment or submission of a certification report must be resolved in a manner similar to the process for on-site deficiency resolution.

(4) Before the NVLAP assessor arrives at the test demonstration site, the laboratory should load, configure, and compile a PCTS and be prepared to run it. During the demonstration the assessor may ask that selected files be reloaded, that configuration files be recreated, and that selected tests be run. The assessor may bring printout showing the results of PCTS runs and ask that results be interpreted by the laboratory. A complete test report produced by the laboratory should be available for discussion.

Sec. 285.33 Criteria for accreditation

(a) Scope

(1) This section sets out the specific requirements in accordance with which a laboratory has to demonstrate that it operates, if it is to be recognized as competent to carry out POSIX conformance testing.

(2) References in NIST Handbook 150 to statistics, physical testing, calibration, test instruments, and interlaboratory comparisons do not generally apply to POSIX conformance testing in the traditional sense.

(b) Organization and management

A laboratory may conduct "first party" testing (testing for clients within its own company), "third party" testing (as an independent laboratory), or both, as long as appropriate policies, procedures, and confidentiality requirements are met.

(c) Quality system, audit and review

(1) The quality system requirements are designed to promote laboratory practices which ensure technical integrity of testing and analyses and adherence to quality practices appropriate to POSIX conformance testing. The laboratory must maintain a quality manual which documents the laboratory procedures and practices and the specific steps taken to ensure the quality of POSIX conformance testing.

The quality manual must contain or refer to documentation which describes and details the laboratory's implementation of procedures covering all of the technical requirements in this handbook. This information will be reviewed by NVLAP assessors during on-site assessments.

(2) The quality manual must include procedures for software handling and integrity, procedures for conduct of testing at client sites, and procedures for converting from one storage medium to another.

The quality system must provide for routine checks of the competence of the staff involved in the conduct and evaluation of tests. The quality manual must contain a detailed test plan for the conduct of NIST POSIX conformance testing and describe how the laboratory assures the accuracy and consistency of its results. Records must be kept of all quality system activities.

The reference documents, standards, and publications for the NVLAP POSIX program listed in Sec. 285.4 of this handbook should be available in the laboratory for reference in developing and maintaining the quality system.

The laboratory should establish and maintain documented procedures for the review of

contracts between itself and its clients. The contract review should be conducted to assure that the laboratory is capable of providing the service and that the requirements, rights, and responsibilities of the parties are understood.

(3) Audits and review must be conducted on a periodic basis.

(i) In the case where only one member of a laboratory staff is competent to conduct specific aspects of the conformance testing program, audits must at least include documentation and instructions, adherence to procedures and instructions, and documentation of the audit findings.

(ii) In order to audit technical aspects of the program, external audits by NVLAP or another appropriate organization, submission of certification test reports to NIST, and/or telephone audits by Technical Experts may be necessary.

(d) Personnel

(1) The laboratory shall maintain a competent administrative and technical staff appropriate for POSIX conformance testing. The laboratory shall maintain position descriptions and resumes for the staff members assigned to POSIX testing related positions and responsible supervisory personnel.

The laboratory shall maintain a list of personnel designated to fulfill NVLAP requirements including; laboratory director, Authorized Representative, Approved Signatories, and key technical person in the laboratory. The laboratory must assign a staff member who has overall responsibility for the quality system and the quality manual.

(2) Laboratories shall document the required qualifications of each staff position involved in the POSIX conformance testing process. The staff information may be kept in the laboratory's official personnel folders or in separate, official folders that contain only the information that the NVLAP assessor(s) needs to review.

(3) The laboratory shall have staff members with appropriate college degrees or working experience who are knowledgeable in the "C" programming language, POSIX standards, appropriate operating systems, and the NIST-PCTS. This experience and expertise shall be documented.

(4) The laboratory shall have a detailed documented description of its training program for new and current staff members. Each new staff member must be trained for assigned duties. Current staff members must be retrained when hardware and/or software are changed or they are assigned new responsibilities. Each staff member may receive training for assigned duties either through on-the-job training, formal classroom study or other appropriate mechanism.

(5) The laboratory shall evaluate the competency of each staff member for each test method the staff member is authorized to conduct. An evaluation and an observation of performance must be conducted annually for each staff member by the immediate supervisor or a designee appointed by the laboratory director. A record of the annual evaluation of each staff member must be dated and signed by the supervisor and the employee.

A description of competency review programs shall be maintained in the quality manual.

(e) Accommodation and environment

(1) The laboratory shall have adequate facilities to meet the requirements for NVLAP accreditation. This includes facilities for conformance testing, staff training, record-keeping, document storage, and software storage.

(2) While not required by the certification program, e-mail capability is valuable. The NIST PCTS and related documents are available by e-mail and test reports may be sent to NIST by e-mail.

(f) Equipment and reference materials

(1) The laboratory shall meet the following requirements:

(i) own a properly licensed copy of the NIST-PCTS;

(ii) have access to facilities (on or off site) to load the NIST-PCTS from its distribution onto each POSIX compatible environment;

(iii) execute the NIST-PCTS; and

(iv) produce printed output of the test results.

(2) While a laboratory is not required to maintain a POSIX conforming system on-site, it must have available the equipment needed to train staff and to perform proficiency testing using the NIST-PCTS.

(3) For the POSIX program, the reference to removal from service of defective equipment in NIST Handbook 150, Section 285.33(f)(2) shall only apply to the NIST POSIX Conformance Test Suite.

(g) Measurement traceability and calibration

(1) ***Measurement traceability and calibration requirements do not apply to NIST POSIX Conformance Testing.***

(2) The traceability of the test results are assured through the use of the NIST POSIX Conformance Test Suite.

(h) Calibration and test methods

(1) Tests may be conducted at the client or laboratory site or other mutually agreed upon site. Written procedures must be maintained and followed for testing at sites outside of the laboratory.

(2) Laboratories shall use only the test methods described in the CSL *NIST POSIX Testing Policy* (see Sec. 285.4). When exceptions are deemed necessary for technical reasons, the client shall be informed and details shall be described in the test report. Substantive documentation shall be provided on exceptions taken to the NIST-PCTS to ensure that the correct and required precision of the test assertion is maintained. These reports may be used to update the NIST-PCTS and its accompanying documentation.

(3) In addition to the NIST-PCTS document, copies of other documents the laboratory uses which describe or elaborate on the meaning of the test procedures must be available to laboratory personnel when those documents apply to the testing being performed.

(4) The laboratory shall maintain documented procedures for testing and shall document the use of those procedures for each client test. These procedures shall include:

(i) control of hardware configuration;

(ii) control of the system under test, especially if there are other users on the system during the conduct of the test;

(iii) method for system software control;

(iv) procedures for installation of the PCTS on the system;

(v) verification of the system and software before each test; and

(vi) approach for documenting operation of the system under test.

(5) Errors or problems experienced with the NIST-PCTS should be reported in writing to the NIST POSIX Test Program.

(j) Records

(1) The laboratory must maintain a functional record-keeping system for each client testing process. Records must be easily accessible and contain complete information on the subject. Magnetic storage media must be logged and properly marked.

(2) Records covering the following are required and will be reviewed during the on-site visit either in total or by selective sampling:

(i) quality system;

(ii) staff training records and competency reviews;

(iii) software versions and updates;

(iv) NIST-PCTS test suite;

(v) NIST-PCTS test documentation;

(vi) statement of policy and conditions for testing;

(vii) list of NIST-PCTS test assertions;

(viii) comprehensive audit logs of test activities;

(ix) problems with test system and documentation of resolution;

(x) configuration file changed for testing each implementation;

(xi) Installation Reports for each test;

(xii) Raw Journal Reports for each test; and

(xiii) Output Reports for each test.

(k) Certificates and reports

The laboratory shall issue test reports of its work which accurately, clearly, and unambiguously present the test conditions, test setup, test results, and all required information. Test reports to clients should meet contractual requirements. Test reports should provide all necessary information to permit the same or another laboratory to repeat the test and obtain comparable results.

There are two basic types of test reports:

- reports that are produced under contract and intended for use by the client; and

- reports to be submitted to NIST/CSL for the NIST POSIX Certification Program.

Reports intended for use only by the client shall meet client/laboratory contract obligations and be complete, but need not necessarily meet all certification requirements. The test report or the test folder maintained by the laboratory must contain sufficient information for the exact test conditions to be repeated at a later time if a retest is necessary.

Test reports created for submission to the NIST POSIX Certification Program must meet the requirements of the NIST POSIX Testing Policy. Test reports shall be submitted in the form and by the method specified. Corrections and additions to the test report will be made according to the Testing Policy.

For test reports created for purposes other than certification, the laboratory shall issue corrections or additions to a test report only by a further document suitably marked. If the change involves a test assertion(s), this document must specify which test assertion result(s) is in question, the content of the result, the explanation of the result, and the reason for acceptance of the result.

APPENDIX A

SAMPLE ACCREDITATION DOCUMENTS

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

ISO/IEC GUIDE 25:1990
ISO/IEC GUIDE 58:1993
ISO 9002:1994

Certificate of Accreditation

DEPARTMENT OF COMMERCE ★ UNITED STATES OF AMERICA ★

LABORATORY, INC.
ANYTOWN, USA

is recognized under the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. Accreditation is awarded for specific services, listed on the Scope of Accreditation for:

COMPUTER APPLICATIONS TESTING

January 1, 19xx
Effective until

Albert D. Tholen
For the National Institute of Standards and Technology

NVLAP LAB CODE: 0000

National Institute of Standards and Technology NVLAP® *National Voluntary Laboratory Accreditation Program*

ISO/IEC GUIDE 25:1990
ISO/IEC GUIDE 58:1993
ISO 9002:1994

Scope of Accreditation

COMPUTER APPLICATIONS TESTING **NVLAP LAB CODE 0000**

LABORATORY, INC.
1 Main Street
Anytown, USA 00000
John Doe Phone: 301-555-1212

NVLAP Code	*Designation*
17/P03	NIST-PCTS:151-2; National Institute of Standards and Technology - POSIX Conformance Test Suite (NIST-PCTS) for the Federal Information Processing Standard 151-2 (FIPS 151-2), "Portable Operating System Interface (POSIX) - System Application Program Interface [C Language]"

January 1, 19xx
Effective until

For the National Institute of Standards and Technology

APPENDIX B

GENERAL OPERATIONS CHECKLIST

GENERAL OPERATIONS CHECKLIST

Instructions to the Assessor: This checklist addresses general accreditation criteria prescribed in applicable sections of NIST Handbook 150, *NVLAP Procedures and General Requirements*.

This checklist follows and is numbered to correspond to the *NVLAP Procedures and General Requirements*, Subsection 285.33. The numbers in square brackets identify related checklist items. A small black triangle appears in the left-hand margin of selected lines of text throughout this checklist; the marked text applies only to the Calibration Laboratory Accreditation Program (LAP).

Place an "X" beside each checklist item which represents a deficiency. Place a "C" beside each item on which you are commenting for other reasons. Record the item number and your written deficiency explanations and/or comments in this list or on the attached comment sheets. Place a check beside all other items you observed or verified at the laboratory.

SEC. 285.33 CRITERIA FOR ACCREDITATION

(b) *Organization and management*

(1) The laboratory shall be:

_____ (i) legally identifiable;

Legal name of laboratory ownership: _____

(ii) organized and shall operate in such a way that its permanent, temporary and mobile facilities meet the NVLAP requirements [see also (b)(2)(i), (c)(2)(ii)];

_____ (iii) properly identified on the NVLAP Application.

(2) The laboratory shall:

_____ (i) have managerial staff with the authority and resources needed to discharge their duties [see also (b)(1)(ii), (c)(2)(ii)];

_____ (ii) have policies to ensure that its personnel are free from any commercial, financial and other pressures which might adversely affect the quality of their work;

_____ (iii) be organized in such a way that confidence in its independence of judgment and integrity is maintained at all times;

_____ (iv) specify and document the responsibility, authority and interrelation of all personnel who manage, perform or verify work affecting the quality of calibrations and tests;

_____ (v) provide supervision by persons familiar with the calibration or test methods and procedures, the objective of the calibration or test, and the assessment of the results. The ratio of supervisory to non-supervisory personnel shall be such as to ensure adequate supervision;

_____ (vi) have a technical manager (however named) who has overall responsibility for the technical operations;

Name of person: _____

_____ (vii) have a quality manager (however named) who has responsibility for the quality system and its implementation. The quality manager shall have direct access to the highest level of management at which decisions are taken on laboratory policy or resources, and to the technical manager. In some laboratories, the quality manager may also be the technical manager or deputy technical manager;

Name of person: _____

_____ (viii) nominate deputy(ies) in case of absence of the technical or quality manager;

Name(s): _____

_____ (ix) have documented policy and procedures to ensure the protection of clients' confidential information and proprietary rights [see also (c)(2)(xviii)];

_____ (x) where appropriate, participate in interlaboratory comparisons and proficiency testing programs [see also (c)(2)(xiv), (c)(6)(ii), (g)(3)];

_____ (xi) have documented policy and procedures to ensure that its clients are served with impartiality and integrity.

(c) ***Quality system, audit and review***

(1) The laboratory shall:

_____ (i) have an established and maintained quality system appropriate to the type, range and volume of calibration and testing activities it undertakes;

_____ (ii) have the elements of the quality system documented;

_____ (iii) ensure that the quality documentation is available for use by the laboratory personnel;

_____ (iv) define and document its policies and objectives for, and its commitment to, good laboratory practice and quality of calibration or testing services;

_____ (v) have the laboratory management which ensures that these policies and objectives are documented in a quality manual and communicated to, understood, and implemented by all laboratory personnel concerned;

_____ (vi) ensure that the quality manual is maintained current under the responsibility of the quality manager [see also (c)(2)(iv)].

Date of quality manual: _____

Date of latest update: _____

(2) The quality manual, and related quality documentation, shall state the laboratory's policies and operational procedures established in order to meet the NVLAP requirements. The quality manual and related quality documentation shall contain:

_____ (i) a quality policy statement, including objectives and commitments, by top management;

_____ (ii) the organization and management structure of the laboratory, its place in any parent organization and relevant organizational charts;

_____ (iii) the relations between management, technical operations, support services and the quality system;

_____ (iv) procedures for control and maintenance of documentation [see also (c)(1)(vi), (j)(1)];

_____ (v) job descriptions of key staff and reference to the job descriptions of other staff;

_____ (vi) identification of the laboratory's approved signatories (list here or in the comments section): _____

_____

_____ (vii) the laboratory's procedures for achieving traceability of measurements;

_____ (viii) the laboratory's scope of calibrations and/or tests;

_____ (ix) written procedures for ensuring that the laboratory reviews all new work to ensure that it has the appropriate facilities and resources before commencing such work;

_____ (x) reference to the calibration, verification and/or test procedures used;

_____ (xi) procedures for handling calibration and test items;

_____ (xii) reference to the major equipment and reference measurement standards used;

_____ (xiii) reference to procedures for calibration, verification and maintenance of equipment;

_____ (xiv) reference to verification practices including interlaboratory comparisons, proficiency testing programs, use of reference materials and internal quality control schemes [see also (b)(2)(x), (c)(6)(ii), (g)(3)];

(xv) procedures to be followed for feedback and corrective action whenever:

_____ a) testing discrepancies are detected, or

_____ b) departures from documented policies and procedures occur;

_____ (xvi) the laboratory management policies for departures from documented policies and procedures or from standard specifications;

_____ (xvii) procedures for dealing with complaints [see also (n)];

_____ (xviii) procedures for protecting confidentiality and proprietary rights [see also (b)(2)(ix)];

_____ (xix) procedures for audit and review;

_____ (xx) a description of the laboratory's policy regarding the use of the NVLAP logo;

► _____ (xxi) a statement of the laboratory's policy for establishing and changing
► calibration intervals for equipment it controls; and

▸ _____ (xxii) a statement of the laboratory's policy concerning the technique(s) to be used
▸ for determining measurement uncertainty and calibration/verification
▸ adequacy.

_____ (3) The laboratory shall arrange for audits of its activities at appropriate intervals to verify that its operations continue to comply with the requirements of the quality system. Such audits shall be carried out by trained and qualified staff who are, wherever possible, independent of the activity to be audited. Where the audit findings cast doubt on the correctness or validity of the laboratory's calibration or test results, the laboratory shall take immediate corrective action and shall immediately notify, in writing, any client whose work may have been affected.

The audits shall be objective and be conducted internally or on contract. The audits shall include both general criteria (documents, records and policies) and technical compliance (test methods and practices and calibration procedures).

_____ (4) The quality system adopted to satisfy the NVLAP requirements shall be reviewed at least once a year by the management to ensure its continuing suitability and effectiveness and to introduce any necessary changes or improvements.

_____ (5) All audit and review findings and any corrective actions that arise from them shall be documented. The person responsible for quality shall ensure that these actions are discharged within the agreed timescale.

(6) In addition to periodic audits the laboratory shall ensure the quality of results provided to clients by implementing checks. These checks shall be reviewed and shall include, as appropriate, but not be limited to:

_____ (i) internal quality control plans, such as control charts and other available statistical techniques;

NOTE: Measurement assurance techniques are acceptable means to control the measurement process and consistently produce the highest quality measurements.

_____ (ii) participation in proficiency testing or other interlaboratory comparisons [see also (b)(2)(x), (c)(2)(xiv), (g)(3)];

_____ (iii) regular use of certified reference materials and/or in-house quality control using secondary reference materials;

_____ (iv) replicate testings using the same or different methods;

_____ (v) retesting of retained items;

_____ (vi) correlation of results for different characteristics of an item.

(d) ***Personnel*** [see also (c)(2)(v)]

_____ (1) The testing laboratory shall have sufficient personnel, having the necessary education, training, technical knowledge and experience for their assigned functions.

_____ (2) The testing laboratory shall ensure that the training of its personnel is kept up-to-date.

_____ (3) Records on the relevant qualifications, training, skills and experience of the technical personnel shall be maintained by the laboratory.

(e) ***Accommodation (facilities) and environment*** [see also (i)(3)]

_____ (1) Laboratory accommodation, calibration and test areas, energy sources, lighting, heating and ventilation shall be such as to facilitate proper performance of calibrations or tests.

NOTE: Laboratory design will be, to the maximum extent practical, in accordance with the guidelines found in the NCSL Recommended Practice #7, *Laboratory Design*, July 25, 1993.

_____ (2) The environment in which these activities are undertaken shall not invalidate the results or adversely affect the required accuracy of measurement. Particular care shall be taken when such activities are undertaken at sites other than the permanent laboratory premises.

NOTE: It is expected that environments which do not meet generally accepted norms, such as those found in NCSL Recommended Practice #7, yet which exhibit the stability required to apply necessary correction factors, will be specified by the laboratory for the purpose of assessment of compliance with its own procedures to achieve its stated uncertainties.

_____ (3) The laboratory shall provide facilities for the effective monitoring, control and recording of environmental conditions as appropriate. Due attention shall be paid, for example, to biological sterility, dust, electromagnetic interference, humidity, voltage, temperature, and sound and vibration levels, as appropriate to the calibrations or tests concerned.

_____ (4) There shall be effective separation between neighboring areas when the activities therein are incompatible.

_____ (5) Access to and use of all areas affecting the quality of these activities shall be defined and controlled.

_____ (6) Adequate measures shall be taken to ensure good housekeeping in the laboratory..

NOTE: While it is the laboratory's responsibility to comply with relevant health and safety requirements, this is outside the scope of this assessment.

(f) *Equipment and reference materials*

(1) The laboratory shall:

_____ (i) be furnished with all items of equipment (including hardware, software, and reference materials) required for the correct performance of calibrations and tests;

_____ (ii) in those cases where the laboratory needs to use equipment outside its permanent control, including rented, leased and client-owned equipment, ensure that the relevant NVLAP requirements are met.

_____ (2) All equipment shall be properly maintained. Maintenance procedures shall be documented. Any item of the equipment which has been subjected to overloading or mishandling, or which gives suspect results, or has been shown by verification or otherwise to be defective, shall be taken out of service, clearly identified and wherever possible stored at a specified place until it has been repaired and shown by calibration, verification or test to perform satisfactorily. The laboratory shall examine the effect of this defect on previous calibrations or tests.

_____ (3) Each item of equipment including reference materials shall, when appropriate, be labelled, marked or otherwise identified to indicate its calibration status.

_____ (4) Records shall be maintained of each item of equipment and all reference materials significant to the calibrations or tests performed. The records shall include:

_____ (i) the name of the item of equipment, software or reference material;

_____ (ii) the manufacturer's name, type identification, and serial number or other unique identification;

_____ (iii) date received and date placed in service;

NOTE: For initial accreditation, the date received and the date placed in service are not considered mandatory requirements for inclusion in laboratory records, although this is encouraged as good laboratory practice.

_____ (iv) current location, where appropriate;

_____ (v) condition when received (e.g., new, used, reconditioned);

_____ (vi) copy of the manufacturer's instructions, where available;

_____ (vii) dates and results of calibrations and/or verifications and date of next calibration and/or verification;

_____ (viii) details of maintenance carried out to date and planned for the future;

_____ (ix) history of any damage, malfunction, modification or repair;

▸ _____ (x) measured value observed for each parameter found to be out of tolerance
▸ during calibration/verification.

(g) ***Measurement traceability and calibration***

_____ (1) All measuring and testing equipment having an effect on the accuracy or validity of calibrations or tests shall be calibrated and/or verified before being put into service. The laboratory shall have an established program for the calibration and verification of its measuring and test equipment. The program will ensure the recall or removal from service of any standard or equipment which has exceeded its calibration interval or is otherwise judged to be unreliable.

_____ (2) The overall program of calibration and/or verification and validation of equipment shall be designed and operated so as to ensure that, wherever applicable, measurements made by the laboratory are traceable to national standards of measurement where available. Calibration certificates shall, wherever applicable, indicate the traceability to national standards of measurement and shall provide the measurement results and associated uncertainty of measurement and/or a statement of compliance with an identified metrological specification.

NOTE: Traceability to national standards includes traceability to standards maintained or defined at national laboratories in foreign countries where applicable. In these cases, traceability is achieved via international standards. This includes intrinsic standards of measurement where available.

Where applicable, the methodology of the *Guide to the expression of uncertainty in measurement*: 1993, shall be used as the basis for expression of uncertainty of the measurement. NIST Technical Note 1297; January 1993, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, is a practical application document written around the *Guide to the expression of uncertainty in measurement*. Where detailed procedures are not used to quantify and combine uncertainties (i.e., use of test accuracy ratio concepts), the sources of uncertainty shall be tabulated and demonstrated to be acceptable for the measurement undertaken.

NOTE: A significant number of intrinsic standards, such as the Josephson Array Voltage Standard and the Iodine-Stabilized Helium-Neon Laser Length Standard, have been developed and are now being used by many national standards laboratories and some industrial laboratories. These standards are based on well-characterized laws of physics, fundamental constants of nature, or invariant properties of materials, and make ideal stable, precise, and accurate measurement standards if properly designed, characterized, operated, monitored and maintained. Where intrinsic standards are used, the laboratory should demonstrate by measurement assurance techniques, interlaboratory comparisons, or other suitable means, that its intrinsic standard measurement results are correlated with those of national or international standards.

_____ (3) Where traceability to national standards of measurement is not applicable, the laboratory shall provide satisfactory evidence of correlation of results, for example by participation in a suitable program of interlaboratory comparisons or proficiency testing [see also (b)(2)(x), (c)(2)(xiv), (c)(6)(ii)].

NOTE: Traceability requirements may also be satisfied by:

(i) internationally accepted standards in the field concerned;

(ii) suitable reference materials;

(iii) ratio or reciprocity measurements; or

(iv) mutual consent standards which are clearly specified and mutually agreed upon by all parties concerned.

_____ (4) Reference standards of measurement held by the laboratory shall be used for calibration only and for no other purpose, unless it can be demonstrated that their performance as reference standards has not been invalidated.

_____ (5) Reference standards of measurement shall be calibrated by a body that can provide traceability to a national standard of measurement. There shall be a program of calibration and verification for reference standards.

_____ (6) Where relevant, reference standards and measuring and testing equipment shall be subjected to in-service checks between calibrations and verifications.

_____ (7) Reference materials shall, where possible, be traceable to national or international standards of measurement, or to national or international standard reference materials.

(h) ***Calibration and test methods***

_____ (1) The laboratory shall have documented instructions on the use and operation of all relevant equipment, on the handling and preparation of items and for calibration and/or testing, where the absence of such instructions could jeopardize the calibrations or tests. All instructions, standards, manuals and reference data relevant to the work of the laboratory shall be maintained up-to-date and be readily available to the staff.

_____ (2) The laboratory shall use appropriate methods and procedures for all calibrations and tests and related activities within its responsibility (including sampling, handling, transport and storage, preparation of items, estimation of uncertainty of measurement and analysis of calibration and/or test data). They shall be consistent with the accuracy required, and with any standard specifications relevant to the calibrations or tests concerned.

NOTES:

(i) Calibration procedures shall contain the required range and tolerance or uncertainty of each item or unit parameter being calibrated or verified. In addition, the procedures shall contain the generic description of the measurement standards and equipment needed with the required parameter, range, tolerances or uncertainties, and specifications for performing the measurement of the calibration or verification, and/or representative types (manufacturer, model, option) that are capable of meeting the generic description for the measurement standards. The procedures shall be consistent with the accuracy required, and with any standard specifications relevant to the calibrations/verifications concerned.

(ii) The laboratory shall ensure that the calibration uncertainties are sufficiently small so that the adequacy of the measurement is not affected. Well-defined and documented measurement assurance techniques or uncertainty analyses may be used to verify the adequacy of a measurement process. If such techniques are not used, then the collective uncertainty of the measurement standards shall not exceed 25% of the acceptable tolerance (e.g., manufacturer's specification) for each characteristic of the measuring and test equipment being calibrated or verified.

_____ (3) Where methods are not specified, the laboratory shall, wherever possible, select methods that have been published in international or national standards, those published by reputable technical organizations or in relevant scientific texts or journals.

_____ (4) Where it is necessary to employ methods that have not been established as standard, these shall be subject to agreement with the client, be fully documented and validated, and be available to the client and other recipients of the relevant reports [see also (k)(2)(x)].

_____ (5) Where sampling is carried out as part of the test method, the laboratory shall use documented procedures and appropriate statistical techniques to select samples [see also (k)(2)(ix)].

_____ (6) Calculations and data transfers shall be subject to appropriate checks.

(7) Where computers or automated equipment are used for the capture, processing, manipulation, recording, reporting, storage or retrieval of calibration or test data, the laboratory shall have written procedures which ensure that:

_____ (i) the NVLAP requirements are complied with;

_____ (ii) computer software, computers or automated equipment is documented and adequate for use;

_____ (iii) procedures are established and implemented for protecting the integrity of data; such procedures shall include, but not be limited to, integrity of data entry or capture, data storage, data transmission and data processing;

_____ (iv) computer and automated equipment is maintained to ensure proper functioning and provided with the environmental and operating conditions necessary to maintain the integrity of calibration and test data [see also (f)(1)];

_____ (v) it establishes and implements appropriate procedures for the maintenance of security of data including the prevention of unauthorized access to, and the unauthorized amendment of, computer records.

_____ (8) Documented procedures shall exist for the purchase, reception and storage of consumable materials used for the technical operations of the laboratory [see also (m)(2)].

(i) ***Handling of calibration and test items***

_____ (1) The laboratory shall have a documented system for uniquely identifying the items to be calibrated or tested, to ensure that there can be no confusion regarding the identity of such items at any time [see also (k)(2)(v)].

_____ (2) Upon receipt, the condition of the calibration or test item, including any abnormalities or departures from standard condition as prescribed in the relevant calibration or test method, shall be recorded. Where there is any doubt as to the item's suitability for calibration or test, where the item does not conform to the description provided, or where the calibration or test required is not fully specified, the laboratory shall consult the client for further instruction before proceeding. The laboratory shall establish whether the item has received all necessary preparation, or whether the client requires preparation to be undertaken or arranged by the laboratory.

_____ (3) The laboratory shall have documented procedures and appropriate facilities to avoid deterioration or damage to the calibration or test item, during storage, handling, preparation, and calibration or test; any relevant instructions provided with the item shall be followed. Where items have to be stored or conditioned under specific environmental conditions, these conditions shall be maintained, monitored and recorded where necessary. Where a calibration or test item or portion of an item is to be held secure (for example, for reasons of record, safety or value, or to enable check calibrations or tests to be performed later), the laboratory shall have storage and security arrangements that protect the condition and integrity of the secured items or portions concerned [see also (e)].

_____ (4) The laboratory shall have documented procedures for the receipt, retention or safe disposal of calibration or test items, including all provisions necessary to protect the integrity of the laboratory.

_____ (5) Tamper-resistant seals shall be affixed to operator-accessible controls or adjustments on measurement standards or measuring and test equipment which, if moved, will invalidate the calibration. The laboratory's calibration system shall provide instructions for the use of such seals and for the disposition of equipment with damaged or broken seals.

NOTE: Tamper-resistant seals are sometimes affixed to equipment to prevent unauthorized access to areas where adjustments or critical components are located.

(j) *Records*

_____ (1) The laboratory shall maintain a record system to suit its particular circumstances and comply with any applicable regulations. It shall retain on record all original observations, calculations and derived data, calibration records and a copy of the calibration certificate, test certificate or test report for an appropriate period. The records for each calibration and test shall contain sufficient information to permit their repetition. The records shall include the identity of personnel involved in sampling, preparation, calibration or testing [see also (c)(2)(iv)].

▸ **EXCEPTION:** The retention of all original observations, calculations, and
▸ derived data in the calibration record system is not a mandatory requirement
▸ for calibration laboratories, although it is encouraged as good laboratory
▸ practice.

_____ (2) All records (including those listed in (f)(4) pertaining to calibration and test equipment), certificates and reports shall be safely stored, held secure and in confidence to the client [see also (b)(2)(ix), (c)(2)(xviii)].

NOTE: The period of retention shall be specified in the quality manual.

Record retention time specified: _____

(k) *Certificates and reports*

_____ (1) The results of each calibration, test, or series of calibrations or tests carried out by the laboratory shall be reported accurately, clearly, unambiguously and objectively, in accordance with any instructions in the calibration or test methods. The results should normally be reported in a calibration certificate, test report or test certificate and should include all the information necessary for the interpretation of the calibration or test results and all information required by the method used [see also (k)(4)(i)].

NOTE: It is recognized that the results of each calibration do not always result in the production of a calibration certificate or report. Whenever a certificate or report is produced, the above requirements shall be met.

(2) Each certificate or report shall include at least the following information:

_____ (i) a title, e.g., "Calibration Certificate," "Test Report" or "Test Certificate";

_____ (ii) name and address of laboratory, and location where the calibration or test was carried out if different from the address of the laboratory;

_____ (iii) unique identification of the certificate or report (such as serial number) and of each page, and the total number of pages;

_____ (iv) name and address of client, where appropriate;

_____ (v) description and unambiguous identification of the item calibrated or tested [see also (i)(1)];

_____ (vi) characterization and condition of the calibration or test item;

_____ (vii) date of receipt of calibration or test item and date(s) of performance of calibration or test, where appropriate;

EXCEPTION: Although it is encouraged as good laboratory practice, the requirement for inclusion of the date received is not mandatory for calibration laboratories.

_____ (viii) identification of the calibration or test method used, or unambiguous description of any non-standard method used;

_____ (ix) reference to sampling procedure, where relevant [see also (h)(5)];

_____ (x) any deviations from, additions to or exclusions from the calibration or test method, and any other information relevant to a specific calibration or test, such as environmental conditions [see also (c)(2)(xv), (h)(4)];

_____ (xi) measurements, examinations and derived results, supported by tables, graphs, sketches and photographs as appropriate, and any failures identified;

_____ (xii) a statement of the estimated uncertainty of the calibration or test result, where relevant;

_____ (xiii) a signature and title, or an equivalent identification of the person(s) accepting responsibility for the content of the certificate or report (however produced), and date of issue [see also (c)(2)(vi)];

_____ (xiv) where relevant, a statement to the effect that the results relate only to the items calibrated or tested;

_____ (xv) a statement that the certificate or report shall not be reproduced except in full, without the written approval of the laboratory;

_____ (xvi) a statement that the report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government;

_____ (xvii) the signature of an approved signatory for all test and calibration reports endorsed with the NVLAP logo;

▸ _____ (xviii) special limitations of use; and

▸ _____ (xix) traceability statement.

_____ (3) Where the certificate or report contains results of calibrations or tests performed by subcontractors, these results shall be clearly identified [see also (l)].

_____ (4) Particular care and attention shall be paid to the arrangement of the certificate or report, especially with regard to presentation of the calibration or test data and ease of assimilation by the reader. The format shall be carefully and specifically designed for each type of calibration or test carried out, but the headings shall be standardized as far as possible [see also (k)(1)].

_____ (5) Material amendments to a calibration certificate, test report or test certificate after issue shall be made only in the form of a further document, or data transfer including the statement "Supplement to Calibration Certificate (or Test Report or Test Certificate), serial number ... (or as otherwise identified)," or equivalent form of wording. Such amendments shall meet all the relevant requirements of item (j).

_____ (6) The laboratory shall notify clients promptly, in writing, of any event such as the identification of defective measuring or test equipment that casts doubt on the validity of results given in any calibration certificate, test report, or test certificate or amendment to a report or certificate.

NOTE: Such notification shall quantify the magnitude of error created in the calibration results. The laboratory shall notify customers promptly, in writing, of any customer's measuring and test equipment found significantly out of tolerance during the calibration/verification process. Measurement data shall be reported so that appropriate action can be taken.

_____ (7) The laboratory shall ensure that, where clients require transmission of calibration or test results by telephone, telex, facsimile or other electronic or electromagnetic means, staff will follow documented procedures that ensure that the NVLAP requirements are met and that confidentiality is preserved.

_____ (8) Whenever a laboratory accredited by NVLAP issues a calibration or test report which contains data covered by the accreditation and also data not covered by the accreditation, it must clearly identify in its records, and in the report to the client, specifically which calibration or test method(s), or portion of a calibration or test method(s), was not covered by the accreditation. The laboratory must also inform the client, before the fact, when calibrations or tests requested are not covered by the accreditation.

NVLAP policy regarding calibration and test reports issued by an accredited laboratory, which reference the laboratory's accredited status, requires that any calibration or test report containing data from calibrations or tests which are not covered by the accreditation include:

_____ (i) a statement at the beginning of the report prominently indicating, "This report contains data which are not covered by the NVLAP accreditation"; and

_____ (ii) a clear indication of which data are not covered by the accreditation.

The laboratory must not misrepresent its accreditation. When a client requires or requests accredited services and any of the requested services are not covered by the accreditation, the client must be so advised.

(l) ***Subcontracting of calibration or testing*** [see also (k)(3)]

_____ (1) Where a laboratory subcontracts any part of the calibration or testing, this work shall be placed with a laboratory complying with these requirements. The laboratory shall ensure and be able to demonstrate that its subcontractor is competent to perform the activities in question and complies with the same criteria of competence as the laboratory in respect of the work being subcontracted. The laboratory shall advise the client in writing of its intention to subcontract any portion of the testing to another party.

_____ (2) The laboratory shall record and retain details of its investigation of the competence and compliance of its subcontractors and maintain a register of all subcontracting.

_____ (3) A NVLAP-accredited laboratory intending to subcontract testing or calibration work that will be performed and reported as meeting NVLAP procedures and criteria must:

_____ (i) have in its quality manual a subcontracting policy compatible with the NVLAP policy, with a description of the procedures for administering and implementing those actions to demonstrate the conformance and consistency of the subcontracted laboratory to perform according to NVLAP procedures;

_____ (ii) place the subcontracted work with a laboratory that maintains accreditation established by NVLAP shown by a current NVLAP Lab Code, or provide and maintain current records that demonstrate that the subcontracted laboratory is competent to perform the test(s) or calibration(s) and that it operates in a manner consistent with and in conformance to NVLAP criteria for accreditation;

_____ (iii) clearly identify in its records, and in the report to the client, exactly which data were obtained by the NVLAP-accredited laboratory and which data were obtained by the subcontractor, NVLAP-accredited or not;

_____ (iv) inform its client, before the fact, that it intends to subcontract for completion of all or a portion of the client's work; and

_____ (v) include at the beginning of the report the name, address, and contact person of the subcontracted laboratory(ies), and one of the following statements, as appropriate:

if NVLAP-accredited

"This report contains data which were produced by a subcontracted laboratory **ACCREDITED (NVLAP LAB CODE)** for the calibration or test methods performed"

if not NVLAP-accredited

"This report contains data which were produced by a subcontracted laboratory **NOT ACCREDITED** for the calibration or test methods performed."

The requirements of this section do not supersede any regulation, law, contract specification, or other related conditions which require NVLAP accreditation.

(m) ***Outside support services and supplies***

_____ (1) Where the laboratory procures outside services and supplies in support of calibrations or tests, the laboratory shall use only those outside support services and supplies that are of adequate quality to sustain confidence in the laboratory's calibrations or tests.

_____ (2) Where no independent assurance of the quality of outside support services or supplies is available, the laboratory shall have procedures to ensure that purchased equipment, materials and services comply with specified requirements. The laboratory should, wherever possible, ensure that purchased equipment and consumable materials are not used until they have been inspected, calibrated or otherwise verified as complying with any standard specifications relevant to the calibrations or tests concerned [see also (h)(8)].

_____ (3) The laboratory shall maintain records of all suppliers from whom it obtains support services or supplies required for calibrations or tests.

(n) ***Complaints*** [see also (c)(2)(xvii)]

_____ (1) The laboratory shall have documented policy and procedures for the resolution of complaints received from clients or other parties about the laboratory's activities. A record shall be maintained of all complaints and of the actions taken by the laboratory.

_____ (2) Where a complaint, or any other circumstance, raises doubt concerning the laboratory's compliance with the laboratory's policies or procedures, or with the NVLAP requirements or otherwise concerning the quality of the laboratory's calibrations or tests, the laboratory shall ensure that those areas of activity and responsibility involved are promptly audited in accordance with item (c)(3).

(o) ***Measuring and test equipment (M & TE)***

NOTE: This section applies to the control of measuring and test equipment (M & TE) used to assure that supplies and services comply with prescribed customer requirements. It is based in large part on the requirements found in government audit standards such as MIL-STD 45662A, and is found in Part II of the ANSI/NCSL Z540-1-1994 (Draft) standard.

(1) General requirements for M & TE

_____ (i) The supplier shall establish and document a system to control the calibration/verification of M & TE.

_____ (ii) M & TE used to determine compliance with customer technical specifications shall be calibrated or verified in accordance with sections 285.33(b) through (n).

_____ (iii) The supplier shall have a program to recall for calibration or verification, or remove from service, M & TE that has exceeded its calibration interval, has broken calibration seals, or is suspected to be malfunctioning because of mishandling, misuse, or unusual results.

_____ (iv) All operations performed by the supplier in compliance with these requirements shall be subject to customer verification at unscheduled intervals.

_____ (v) The supplier shall carry out, or arrange to have carried out, periodic quality auditing of the calibration and verification system in order to ensure its continuing effective implementation and compliance with these requirements.

- Based on the results of the audits and any other relevant factors, such as customer feedback, the supplier shall review and modify the system as necessary.

- Plans and procedures for the audits shall be documented. The conduct of the audit and any subsequent corrective action shall also be documented.

(2) Detailed requirements for M & TE

_____ (i) Calibration system description: The supplier shall provide and maintain a written description of the calibration/verification system covering M & TE and measurement standards. The description shall be sufficient to satisfy each requirement of section 285.33(o) and any deviations shall be submitted with supporting documentation to the customer for approval.

_____ (ii) Adequacy of measurement standards: Measurement standards used by the supplier for calibrating M & TE and other measurement standards shall comply with the requirements of items (f)(1), (g)(1), and (h)(2).

_____ (iii) Environmental conditions: M & TE shall be used in an environment controlled to the extent necessary to ensure valid results. Due consideration shall be given to temperature, humidity, lighting, vibration, dust control, cleanliness, electromagnetic interference and any other factors affecting the results of measurements. Where pertinent, these factors shall be monitored and recorded and, when appropriate, correcting compensations shall be applied to measurement results.

_____ (iv) Intervals of calibration and verification: M & TE requiring calibration shall be calibrated or verified at periodic intervals established and maintained to assure acceptable reliability, where reliability is defined as the probability that M & TE will remain in-tolerance throughout the interval. Intervals shall be established for all M & TE requiring calibration unless the equipment is regularly monitored through the use of check standards in a documented measurement assurance process. Check standards must closely represent the item parameters normally tested in the process and the check standard must be verified periodically. Where intervals are used to ensure reliability, the interval setting system must be systematically applied and shall have stated reliability goals and a method of verifying that the goals are being attained. Intervals may be based on usage or time since last calibration or verification. All exemptions from periodic calibration or verification shall be documented. The recall system may provide for the temporary extension of the calibration due date for limited periods of time under specified conditions that do not unreasonably impair the satisfaction of the customer's requirements.

_____ (v) Calibration procedures: Procedures used to calibrate/verify the supplier's M & TE shall comply with the requirements of items (h)(1) and (h)(2).

_____ (vi) Out-of-tolerance conditions: If any M & TE is found to be significantly out of tolerance during the calibration/verification process, the supplier's system shall provide for notification to the user and to the supplier's quality element, if appropriate, of the out-of-tolerance condition with the associated measurement data so that appropriate action can be taken.

_____ (vii) Adequacy of calibration system: The supplier shall establish and maintain documented procedures to evaluate the adequacy of the calibration system and to ensure compliance with these requirements.

_____ (viii) Calibration sources: M & TE requiring calibration shall be calibrated or verified by laboratories that comply with sections 285.33(b) through (n).

_____ (ix) Records: These requirements shall be supported by records documenting that established schedules and procedures are followed to maintain the adequacy of all M & TE. The records for M & TE requiring calibration shall include an individual record of calibration or verification, or other means of control, providing a description or identification of the item, calibration interval, date calibrated, identification of the calibration source, calibration results (data and/or condition status) and calibration action taken (adjusted, repaired, new value assigned, derated, etc.).

_____ (x) Calibration status: M & TE shall be labeled to indicate calibration or verification status. The label shall identify specific date calibrated (day, month, year, Julian date, or equivalent) and the specific calibration due date or usage equivalent. Items not calibrated to their full capability or which have other limitations of use, shall be labeled or otherwise identified as to the limitations. When it is impractical to apply a label directly to an item, the label may be affixed to the instrument container or some other suitable means may be used to reflect calibration status. Tamper-resistant seals are affixed to operator accessible controls or adjustments which if moved will invalidate the calibration. The quality system shall provide instructions for the disposition of equipment with broken tamper-resistant seals.

_____ (xi) Control of subcontractor calibration: The supplier is responsible for assuring that the subcontractor's calibration system conforms to section 285.33 (l) to the degree necessary to assure compliance with contractual requirements. NVLAP accreditation of the subcontractor's laboratory can serve as the basis for compliance with this requirement.

_____ (xii) Storage and handling: M & TE shall be handled, stored, and transported in a manner which shall not adversely affect the calibration or condition of the equipment.

NVLAP LAB CODE: [ ]

GENERAL OPERATIONS CHECKLIST - COMMENTS AND DEFICIENCIES

Instructions to the Assessor: Use this sheet to document comments and deficiencies. For each, identify the appropriate item number from the checklist. Identify comments with a "C" and deficiencies with an "X." If additional space is needed, make copies of this page (or use additional blank sheets).

Item No.	*Comments and/or Deficiencies*

GENERAL OPERATIONS CHECKLIST - COMMENTS AND DEFICIENCIES

Instructions to the Assessor: Use this sheet to document comments and deficiencies. For each, identify the appropriate item number from the checklist. Identify comments with a "C" and deficiencies with an "X." If additional space is needed, make copies of this page (or use additional blank sheets).

Item No.	*Comments and/or Deficiencies*

APPENDIX C

SPECIFIC OPERATIONS CHECKLIST

NVLAP LAB CODE: [ ]

National Voluntary Laboratory Accreditation Program (NVLAP)
for
POSIX Conformance Testing

ON-SITE CHECKLIST

Abstract

This checklist is designed for use by a NVLAP Technical Expert(s) (TE) during the conduct of an on-site assessment for initial or renewal of accreditation for POSIX conformance testing. The checklist contains items from the Program Handbook, NVLAP Procedures, and technical references. The checklist is organized into sections similar to the Program Handbook and Procedures.

The completed checklist becomes a part of the laboratory ON-SITE ASSESSMENT REPORT which is used in the evaluation of the laboratory for granting or renewal of accreditation. Deficiencies noted in this checklist must be resolved in accordance with the NVLAP Procedures. Comments not specified as deficiencies may be directed to the laboratory.

Laboratory Name _____

NVLAP Technical Expert(s) _____

On-Site Dates _____

Place Where Demonstration Took Place _____

Instructions to Laboratory

Respond in writing within 30 days of the date of this report, addressing all deficiencies documented by the assessor. Each deficiency must be referenced, in your response, by number as it is listed in the report.

This on-site assessment report conveys the opinion of the assessor as a single representative of NVLAP. The final evaluation of your laboratory for the purpose of recommending approval or denial of accreditation will be conducted by NIST evaluators who will review this report, the written information submitted by you, and results of any required proficiency testing. You must respond to this report by identifying the actions you have taken, or plan to take, to correct the deficiencies identified. Respond in detail so that an accurate evaluation can be completed. Failure to respond may delay an accreditation decision. Questions concerning this report should be directed to NVLAP.

The assessor has discussed the contents of this report with members of the laboratory management who agree to respond in writing to NIST, regarding resolution or correction of any deficiencies noted, within 30 days of the date of this report.

Signature of Authorized Representative or designee	Printed Name	Date

POSIX SPECIFIC OPERATIONS CHECKLIST

Instructions to the Assessor: This checklist addresses specific criteria for the POSIX LAP. For lettered and numbered items, see the NVLAP General Operations Checklist and use the interpretations or explanations given in this checklist. Additional questions provided by this checklist are indicated by [ ].

Place an "X" beside any of the following items which represent a deficiency. Place a "C" beside each item on which you are commenting for other reasons. Record the item number and your deficiency explanation and/or comments on the appropriate comment sheet(s). Place a check beside all other items you observed or verified at the laboratory.

SEC. 285.33 CRITERIA FOR ACCREDITATION

For lettered and number items, see the General Operations Checklist and use the interpretations or explanations given below. Additional questions provided by this checklist are indicated with square brackets, [ ].

(b) Organization and management

(2) The laboratory shall:

(iii) could be demonstrated by the following

[ ] Is there a statement in a Quality System document similar to:

"Maintain an independent decisional relationship between itself and its clients, affiliates, or other organizations so that the test laboratory's capacity to render test reports objectively and without bias is not adversely affected."

(iv) names and positions of relevant staff

(v) name of supervisor

(x) interlaboratory comparisons are not appropriate for NIST POSIX program

[ ] Is an overall organization chart included in the Quality Manual?

[ ] Does the organizational chart show the relationship of the test laboratory to other corporate functions?

If not, does the test laboratory policy state that it "maintains an independent decisional relationship between itself and its clients, affiliates, or other organizations such that the test laboratory's capacity to render test reports objectively and without bias is not adversely affected."

[ ] Does the test laboratory position in the organization delineate the test laboratory from other functions which may influence the testing? If this is not clear from the organization chart, the assessor should request a written or verbal description of each functional unit within the organization.

For first party laboratories (test laboratory is vendor owned), the test laboratory must be as independent as possible within the parent organization. Authorized Representative, Approved Signatory, and test staff shall not be the developers of the implementation nor shall they be organized under the development or production departments. An independent decisional relationship must be maintained between the laboratory and other departments.

For third party laboratories (independent test laboratory), testing may be one of many services offered. The test laboratory should not be organized such that other business units are dependent on the testing activities.

(c) Quality System, audit and review

(2) The quality manual, and related documentation ...

The Quality System documents or references the test laboratory's implementation of procedures for the technical requirements of the NVLAP Program and the NIST/CSL POSIX Testing Policy.

(vii) the laboratory's procedures for achieving traceability of measurements;

should be interpreted as documenting the laboratory's procedures for insuring the correctness of the test suite.

(x) reference to the calibration, verification and/or test procedures used;

should refer to the quality control of the test suite.

(xi) procedures for handling calibration and test items;

should be interpreted as procedures for insuring the integrity of the test suite.

(xii) reference to the major equipment and reference measurement standards used;

should be interpreted as follows. The quality manual should document the reference standards used.

(xiii) reference to procedures for calibration, verification and maintenance of equipment;

should be interpreted as follows. The quality manual should document the procedures used to configure and install a client's product for testing. This should include verifying these procedures with those of the client.

(xiv) reference to verification practices including interlaboratory comparisons ....

should be interpreted as follows. Interlaboratory comparisons are NOT appropriate for POSIX. The quality manual should document the laboratory procedures for quality control of the test suite and the testing procedures.

(xxi and xxii) are NOT appropriate for POSIX.

(6) In addition to periodic audits the laboratory shall ...

(ii) participation in proficiency testing or other interlaboratory comparisons.

Interlaboratory comparisons are NOT appropriate for POSIX.

(iii) regular use of certified reference materials and/or in-house quality control using secondary reference materials;

should be interpreted as use of reference standards, testing policy documents, etc. for resolving questions.

(iv) replicate testing using the same or different methods

is NOT appropriate for POSIX.

(v) retesting of retained items;

is NOT appropriate for POSIX

(vi) correlation of results for different characteristics of an item is NOT appropriate for POSIX.

[ ] Identify the title and name of the person responsible for implementing the Quality System as specified in the policy statement or in the Quality Manual.

[ ] The Quality Manual is available and is accessible to staff?

Record location where Quality Manual is kept:

Record name of person responsible for control of Quality Manual:

[ ] Are the quality procedures constantly being monitored, documented, and updated to ensure on-going improvements to the process? This should be a concern for new test laboratories where procedures most likely can be improved.

[ ] Do the Quality System audit procedures provide for audits in the event of changes to: the staff, scope of accreditation, facilities and equipment?

[ ] Are there procedures for ensuring the reliability and repeatability of test results? Are these procedures documented? Where?

[ ] Do procedures exist for keeping NVLAP informed of major changes to the test laboratory or its Quality System?

Where are these procedures documented?

(d) Personnel

(1) The testing laboratory shall have sufficient personnel ...

List staff personnel responsible for POSIX test method tasks shown below:

[ ] NIST-PCTS:151-2 Updates:_____
[ ] Load: _____
[ ] Configuration: _____
[ ] Compilation/Execution: _____
[ ] Interpretation: _____
[ ] Reporting Generation: _____

(2) The testing laboratory shall ensure the training of its personnel ...

[ ] Are staff training programs and policies adequate? Are they documented in the Quality Manual?

(3) Records on the relevant qualifications, training ...

[ ] Are the qualifications of the individuals designated above documented in the personnel files maintained by the test laboratory?

[ ] Are the qualifications of the individuals designated above consistent with the job descriptions for the positions assigned?

Procedures for competency of staff are maintained:

[ ] Records state the annual reviews for each staff member.

[ ] Records state the test method tasks each staff member is authorized to conduct.

[ ] Each of these entries are dated and signed by the test laboratory manager and the employee.

[ ] Responsibilities are assigned for each test method task (e.g., configuration, testing, analysis). Staff members are aware of both the extent and limitations of their assignments.

[ ] Do job descriptions or equivalent exist for the test laboratory positions/functions listed in the organization chart? Do the job descriptions or equivalent clearly state the responsibilities and extent of responsibilities of the staff?

[ ] Are the staff qualifications for the job descriptions or equivalent stated somewhere in the quality system?

[ ] Do the job descriptions fulfill the requirements of a test laboratory performing POSIX conformance testing (i.e., do the roles performed by the staff encompass the tasks required for POSIX testing)?

[ ] Are there individuals employed by the test laboratory whose responsibilities match the job descriptions from the organizational chart?

[ ] Is the Approved Signatory in a position which allows him/her to adequately attest that testing was conducted in a manner consistent with the criteria for accreditation? Generally, this requires someone in a senior technical position also responsible for providing quality system feedback to management.

[ ] Is the test laboratory manager in a position which allows him/her to adequately ensure quality as it relates to the overall, day-to-day operation of the test laboratory?

(e) Accommodation (facilities) and environment

(3) The laboratory shall provide facilities ...

None of the examples listed, biological sterility, dust, electromagnet interference, humidity, voltage, temperature, and sound and vibrations levels are appropriate for POSIX. The facilities shall be judged as appropriate for computer equipment and software.

[ ] Is a facility available, on or off site, for performing proficiency testing and conducting test method demonstrations and training using the Official NIST-PCTS:151-2 from its distribution media?

[ ] Does adequate physical storage exist for storing and maintaining records of client testing and associated documentation?

[ ] Does this physical storage for record keeping prevent unauthorized access? If so, describe the security measures provided.

[ ] For laboratories conducting third party testing, are there documented, physical measures taken to ensure client security and confidentiality? Record the document reference.

(f) Equipment and reference materials

(2) All equipment ...

This item is not appropriate for POSIX.

(3) Each item of equipment ... calibration status.

This item is not appropriate for POSIX.

(4) Records shall be maintained ...

The laboratory shall maintain records for the NIST PCTS and laboratory owned equipment used in conjunction with POSIX conformance testing.

The laboratory shall have procedures for record keeping and handling of client owned hardware and software when it is in the possession of the test laboratory. This includes, but is not limited to (this list replaces items (4) (i) through (x)):

- date received
- identification of all software including media format
- identification of all hardware
- identification of documentation, PCD, systems manuals, etc.
- report of any damage in shipping

[ ] Assessor documents the test laboratory's communication facility available for communicating with NIST/CSL POSIX on Certification and relevant PCTS items.

e-mail address: _____

FAX number: _____

[ ] Printer to produce a printed output of test results.

(g) Measurement traceability and calibration
(h) Calibration and test methods
(i) Handling of calibration and test items

This section on the POSIX test method and section (c) on the quality system replace all items under sections (g), (h) and (i).

Test Method - the test method is defined by:

- the NIST POSIX Conformance Test Suite for FIPS 151-2;

- procedures defined in the NIST POSIX Testing Policy - Certificate of Validation Requirements for FIPS 151-2;

- the procedures defined in the NIST-PCTS:151-2 Installation and Testing Guide.

[ ] Laboratory owns a copy of the NIST-PCTS:151-2.

Record location of official NIST-PCTS:151-2 storage:
Is this location secure?

Translation of official NIST-PCTS to other media

[ ] Laboratory has facilities to translate official NIST-PCTS to other media as required for conduct of its testing services at its own site or at a client site?

[ ] Laboratory has policies and procedures for having another entity (not the client) translate the official NIST-PCTS to other media as required for conduct of its testing services at its own site or at a client site?

Working copy of NIST-PCTS

[ ] Laboratory has properly documented working copies of the official NIST-PCTS for use in conducting tests.

[ ] Policies and procedures for use of working copies are properly documented.

(j) Records

(1) The laboratory shall maintain a record system ...

This section replaces item 1.

The laboratory shall possess the following required reference documents

[ ] NVLAP Program Handbook, POSIX Conformance Testing.
[ ] FIPS 151-2
[ ] NIST-PCTS:151-2 Installation and Testing Guide, latest version
[ ] NIST POSIX Testing Policy - General Information, latest version
[ ] NIST POSIX Testing Policy - Certification of Validation Requirements for FIPS 151-2, latest version
[ ] FIPS 29-2
[ ] ISO/IEC 9899: Information Technology - Programming Languages C
[ ] ISO/IEC 9945-1:1990 - POSIX.1
[ ] IEEE Std 2003.1-1992 - POSIX.3.1

General Laboratory Documents

[ ] Policy and procedures regarding subcontracting.
[ ] Procedures for handling testing complaints.

Quality System Documents

[ ] Procedures for maintaining the integrity of the test method.
[ ] Hardware tested is hardware requested to be certified.
[ ] System software tested is system software requested to be certified.
[ ] Procedures for assuring the accuracy and consistency of the output results.
[ ] Are there applicant questionnaires and contract forms for clients? (i.e. Some formal mechanism for specifying client-laboratory relationships).

Test Method Control Documents

[ ] Procedures for testing at client site.

[ ] Procedures for transfer of data from official media to implementation under test.

[ ] Procedures for changing hardware configuration.

[ ] Procedures for documenting the "environment" the NIST-PCTS:151-2 is subject to.

[ ] Approach for documenting operation of the system under test.

[ ] Procedures for detecting test discrepancies.

[ ] Procedures for resolving/reporting test discrepancies.

[ ] Procedures for retesting a product.

[ ] Procedures for generating required NIST/CSL POSIX output reports.

The test laboratory must maintain a functional record keeping system for each tested product. Records must be easily accessible and contain the following information.

[ ] Description of test conditions, where testing was completed, when, etc.
[ ] Test assertions problems (e.g., where problems exist, solutions found, etc.)
[ ] Problems with test system and documentation of resolution
[ ] Certification test reports - see NIST/CSL POSIX Testing Policy documents and section (k) on certificates and reports:

    [ ] Completed application form
    [ ] Documentation audit
    [ ] Configuration files
    [ ] Installation report
    [ ] Output report
    [ ] Altered files
    [ ] APTL resolved codes
    [ ] PCD

(k) Certificates and reports

(2) Each certificate or report shall ...

This section replaces item (2).

The following information must be included in the test report or in a laboratory maintained test folder so that the test can be repeated by the same laboratory or reproduced by another laboratory.

[ ] Name and address of test laboratory.
[ ] Identification of test report by serial number, date, or other appropriate means.
[ ] Name and address of client.
[ ] Location where the test was performed
[ ] Unambiguous identification including name, model, serial number, configuration, etc. of the hardware the test method was performed on.
[ ] Unambiguous identification of the operating system software including name, version, and release date.
[ ] Specification of "official" test method used.
[ ] Test method's Installation report.
[ ] Test method's Output report.
[ ] Configuration files used.
[ ] Report on altered svcomp files, if applicable.
[ ] Report on APTL resolved test codes, if applicable.
[ ] POSIX Conformance Document for product tested
[ ] Identification of the organization, the person accepting technical responsibility for the test report, the date of issue, and the signature of NVLAP Approved Signatory.
[ ] Statement, on client's copy, that the report must not be reproduced except in full with the approval of the test laboratory.
[ ] Any other requirements as specified in the NIST/CSL POSIX Testing Policy documents.
[ ] If the test report is intended for submission to NIST/CSL for certification purposes, a copy of the electronic submission must be kept.

(4) Particular care ... arrangement of the certificate or report
(5) Material amendments ...
(6) The laboratory shall notify ...

Items 4, 5, and 6 are not appropriate for POSIX.
Other questions relating to test reports:

[ ] Procedures are established for corrections or additions to an official test report.

[ ] Test reports are retained for a minimum of one year or other period of time required by law or contract.

[ ] Reports and corresponding data are held secure and can be held in confidence if required by a client.

[ ] All test reports endorsed with the NVLAP logo are signed by an Approved Signatory.

[ ] Certification Reports sent to NIST are checked to ensure they have not exceeded the expiration date of the test method version.

National Voluntary Laboratory Accreditation Program (NVLAP)
for
POSIX Conformance Testing

ON-SITE CHECKLIST

POSIX PROFICIENCY TEST AND DEMONSTRATION

1. As part of the site visit, the test laboratory is required to demonstrate:

   - knowledge of the test method,
   - knowledge of the operating system hardware and software being tested,
   - knowledge of IEEE POSIX standards related to the test method,
   - Proficiency in performing the FIPS 151-2 PCD.1 audit
   - proficiency in the use of the test method,
   - knowledge of NIST/CSL requirements for FIPS 151-2 Certification,
   - demonstrate ability to prepare a report for NIST/CSL FIPS 151-2 Certification.

   The assessor is both an observer and a surrogate client during the testing process. As an observer, the assessor should interfere as little as possible. As a client, who wishes to get an implementation Certified as FIPS 151-2 conforming by NIST/CSL POSIX, questions on all procedures and data entries performed by the test laboratory staff are appropriate.

1.1 Test Method Proficiency

1.1.1 Loading

1.1.1.1 [ ] Quality System procedures are enacted and followed in this phase (i.e., operating system software and hardware is verified, proper records and documents are initiated, etc.).

1.1.1.2 [ ] Designated staff member (staff personnel responsible) loads a working copy of the NIST-PCTS on appropriate media into the system under test.

Does the staff perform required update procedures successfully?

Records/documents are maintained properly?

1.1.1.3 [ ] Assessor evaluates staffs proficiency on the task performed, and knowledge of what occurs in the loading process (i.e., format of tape, its contents, files created, permissions of files, etc.).

1.1.2 Configuration

1.1.2.1 [ ] Quality System procedures are enacted and followed in this phase.

1.1.2.2 [ ] Staff member performs the configuration procedures.

IUT PCD.1 is used to assist with the determination of the configuration parameters to be used.

Records/documents are maintained properly?

1.1.2.3 [ ] Assessor evaluates staff performance on the configuration test method task (i.e., knowledge of configuration variables, tty closed loop setup, etc.)

1.1.3 Installation

1.1.3.1 [ ] Quality System procedures are enacted and followed in this test method task.

1.1.3.2 [ ] Staff member installs the test method.

Records and documents are maintained properly?

1.1.3.3 [ ] Assessor evaluates staff performance on the installation test method task.

An unsuccessful installation phase is analyzed and proper Quality System procedures enacted to allow the demonstration to continue.

1.1.4 Execution

1.1.4.1 [ ] Quality System procedures are enacted and followed in this test method task.

1.1.4.2 [ ] Staff member executes the test method.

Records and documents are maintained properly?

1.1.4.3 [ ] Assessor evaluates staff performance on the execution test method task.

An unsuccessful execution is analyzed and proper Quality System procedures enacted to allow the demonstration to continue.

1.2 Certification Report Generation

1.2.1 [ ] Quality System procedures are enacted and followed when reports are generated.

1.2.2 [ ] Reports generated are complete and comply with the required format.

1.2.3 [ ] Staff member interprets the results of the test method.

1.2.4 [ ] Procedures are simulated for preparing required documentation to obtain NIST/CSL FIPS 151-2 Certification.

1.2.5 [ ] Assessor evaluates staff performance on the report generation test method task.

Failures occur, are simulated, or are caused which require the staff to enact Quality System procedures.

Assessor lists questions asked during this test method task and notes any unusual or interesting responses.

1.2.6 [ ] Does the test engineer know the conditions for retesting as based on the test laboratory's Quality System policy?

1.2.7 [ ] FIPS 151-2 documentation audit requirements were properly performed.

1.2.8 [ ] Certification Report files were properly archived for mailing to NIST/CSL.

1.2.9 [ ] Were all test method procedures performed? Assessor should list all shortcuts enacted to complete this phase of the assessment in the allotted time.

1.2.7 [ ] Assessor lists any interesting/unusual observations on the demonstration of this test method task.

1.3 IEEE/FIPS Standards Proficiency

1.3.1 [ ] Assessor evaluates staff understanding of those IEEE and FIPS standards related to the test method used (e.g., attends IEEE meetings, active NIST/CSL Beta site, etc.).

POSIX SPECIFIC OPERATIONS CHECKLIST - COMMENTS AND DEFICIENCIES

Instructions to the Assessor: Use this sheet to document comments and deficiencies. For each, identify the appropriate item number from the checklist. Identify comments with a "C" and deficiencies with an "X." If additional space is needed, make copies of this page (or use additional blank sheets).

Item No.	*Comments and/or Deficiencies*

NVLAP LAB CODE: _____

POSIX SPECIFIC OPERATIONS CHECKLIST - COMMENTS AND DEFICIENCIES

Instructions to the Assessor: Use this sheet to document comments and deficiencies. For each, identify the appropriate item number from the checklist. Identify comments with a "C" and deficiencies with an "X." If additional space is needed, make copies of this page (or use additional blank sheets).

Item No.	*Comments and/or Deficiencies*
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

APPENDIX D

NIST COMPUTER SYSTEMS LABORATORY

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
COMPUTER SYSTEMS LABORATORY

The National Institute of Standards and Technology (NIST), Computer Systems Laboratory (CSL) is responsible for developing U.S. government-wide standards for computer software, hardware, data management, networks and security, and related telecommunication systems. The authority for this responsibility is assigned under Federal Property and Administrative Services Act of 1949, as amended, Public Law 89-306 (79 Stat. 1127), Executive Order 11717 (38 FR 12315, dated May 11, 1973), Part 6 of Title 15 Code of Federal Regulations (CFR), and Public Law 100-235.

CSL develops standards, provides technical assistance, and carries out research to advance the effective use of computers by government and industry. CSL works through voluntary industry standards organizations to develop standards that will meet the needs of government users. These standards are issued as Federal Information Processing Standards (FIPS) and provide the foundation for compatibility, portability, and, where necessary, interoperability among government systems implementing these standards. FIPS also serve as the basis for government acquisition of commercial off-the-shelf products and services from competitive sources.

The pace of standards development for information systems (information processing and telecommunications) has intensified in recent years, stimulated by user needs for interconnectivity of hardware, software, and network systems. These standards are increasingly complex—often describing functional requirements and allowing for numerous options in implementation.

To achieve effective information systems, users need off-the-shelf products that work together and conform to these emerging standards. Where products are expected to support complex standards specifications, conformance testing may be required to reduce risks and raise consumer confidence in information system products.

CSL is responsible for organizing, managing, directing and administering the FIPS program. Among the responsibilities assigned under the FIPS program is the task of insuring that implementations of the FIPS conform to these standards. In carrying out this task, the CSL develops and maintains conformance testing programs for the FIPS. These programs require adequate test methods and procedures, suitable testing laboratories, and a formal acknowledgement of product compliance or noncompliance to FIPS.

For further information the NIST POSIX Conformance Testing Policy contact: Martha M. Gray NIST/CSL, Building 225 room B266, Gaithersburg, MD 20899, telephone (301) 975-3276, e-mail gray@sst.ncsl.nist.gov.

NIST Technical Publications

Periodical

Journal of Research of the National Institute of Standards and Technology—Reports NIST research and development in those disciplines of the physical and engineering sciences in which the Institute is active. These include physics, chemistry, engineering, mathematics, and computer sciences. Papers cover a broad range of subjects, with major emphasis on measurement methodology and the basic technology underlying standardization. Also included from time to time are survey articles on topics closely related to the Institute's technical and scientific programs. Issued six times a year.

Nonperiodicals

Monographs—Major contributions to the technical literature on various subjects related to the Institute's scientific and technical activities.

Handbooks—Recommended codes of engineering and industrial practice (including safety codes) developed in cooperation with interested industries, professional organizations, and regulatory bodies.

Special Publications—Include proceedings of conferences sponsored by NIST, NIST annual reports, and other special publications appropriate to this grouping such as wall charts, pocket cards, and bibliographies.

National Standard Reference Data Series—Provides quantitative data on the physical and chemical properties of materials, compiled from the world's literature and critically evaluated. Developed under a worldwide program coordinated by NIST under the authority of the National Standard Data Act (Public Law 90-396). NOTE: The Journal of Physical and Chemical Reference Data (JPCRD) is published bimonthly for NIST by the American Chemical Society (ACS) and the American Institute of Physics (AIP). Subscriptions, reprints, and supplements are available from ACS, 1155 Sixteenth St., NW, Washington, DC 20056.

Building Science Series—Disseminates technical information developed at the Institute on building materials, components, systems, and whole structures. The series presents research results, test methods, and performance criteria related to the structural and environmental functions and the durability and safety characteristics of building elements and systems.

Technical Notes—Studies or reports which are complete in themselves but restrictive in their treatment of a subject. Analogous to monographs but not so comprehensive in scope or definitive in treatment of the subject area. Often serve as a vehicle for final reports of work performed at NIST under the sponsorship of other government agencies.

Voluntary Product Standards—Developed under procedures published by the Department of Commerce in Part 10, Title 15, of the Code of Federal Regulations. The standards establish nationally recognized requirements for products, and provide all concerned interests with a basis for common understanding of the characteristics of the products. NIST administers this program in support of the efforts of private-sector standardizing organizations.

Order the **following** *NIST publications—FIPS and NISTIRs—from the National Technical Information Service, Springfield, VA 22161.*

Federal Information Processing Standards Publications (FIPS PUB)—Publications in this series collectively constitute the Federal Information Processing Standards Register. The Register serves as the official source of information in the Federal Government regarding standards issued by NIST pursuant to the Federal Property and Administrative Services Act of 1949 as amended, Public Law 89-306 (79 Stat. 1127), and as implemented by Executive Order 11717 (38 FR 12315, dated May 11, 1973) and Part 6 of Title 15 CFR (Code of Federal Regulations).

NIST Interagency Reports (NISTIR)—A special series of interim or final reports on work performed by NIST for outside sponsors (both government and nongovernment). In general, initial distribution is handled by the sponsor; public distribution is by the National Technical Information Service, Springfield, VA 22161, in paper copy or microfiche form.

U.S. DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
National Voluntary Laboratory Accreditation Program (NVLAP)
Building 411, Room A162
Gaithersburg, MD 20899

BULK RATE
POSTAGE & FEES PAID
NIST
PERMIT NO. G195

Official Business

Penalty for Private Use $300

FORWARDING AND RETURN POSTAGE GUARANTEED
ADDRESS CORRECTION REQUESTED